

Title: Compound-specific isotopic analysis of meteoritic amino acids as a tool for evaluating potential formation pathways

Authors: Jamie E. Elsila, Aaron S. Burton, Michael C. Callahan, Steven B. Charnley, Daniel P. Glavin, Jason P. Dworkin

Abstract text:

Measurements of stable hydrogen, carbon, and nitrogen isotopic ratios (δD , $\delta^{13}C$, $\delta^{15}N$) of organic compounds can reveal information about their origin and formation pathways. Several formation mechanisms and environments have been postulated for the amino acids detected in carbonaceous chondrites. As each proposed mechanism utilizes different precursor molecules, the isotopic signatures of the resulting amino acids may point towards the most likely of these proposed pathways. The technique of gas chromatography coupled with mass spectrometry and isotope ratio mass spectrometry provides compound-specific structural and isotopic information from a single splitless injection, enhancing the amount of information gained from small amounts of precious samples such as carbonaceous chondrites. We have applied this technique to measure the compound-specific C, N, and H isotopic ratios of amino acids from seven CM and CR carbonaceous chondrites. We are using these measurements to evaluate predictions of expected isotopic enrichments from potential formation pathways and environments, leading to a better understanding of the origin of these compounds.